

**Claims**

1. Nanoscale, pyrogenically produced zinc oxide powder having a BET surface area of 10 to 200 m<sup>2</sup>/g, characterised in that it is in the form of aggregates of anisotropic primary particles and that the aggregates display an average diameter of 50 to 300 nm.
2. Powder according to claim 1, characterised in that the aggregates comprise a mixture of nodular primary particles and acicular primary particles, whereby the ratio of nodular to acicular primary particles is between 99:1 and 1:99.
3. Powder according to claims 1 or 2, characterised in that the nodular primary particles display an average diameter of 10 to 50 nm and the acicular primary particles a length of 100 nm to 2000 nm and a width of 10 nm to 100 nm.
4. Powder according to claims 1 to 3, characterised in that the aggregates display a largely anisotropic structure, defined by a shape factor  $F(\text{circle})$  of below 0.5.
5. Powder according to claim 1 to 4, characterised in that the oxygen concentration at the surface of the powder as non-desorbable moisture in the form of Zn-OH and/or Zn-OH<sub>2</sub> units, determined by XPS analysis of the oxygen signals at 532 to 533 eV and 534 to 535 eV, is at least 40%.
6. Powder according to claim 1 to 5, characterised in that the transmission at a wavelength of 310 nm and 360 nm is no more than 60 %.
7. Powder according to claims 1 to 6, characterised in that the bulk density is between 40 and 120 g/l.

8. Process for the production of the powder according to claims 1 to 7, characterised in that zinc powder is converted to zinc oxide powder in four successive reaction zones, evaporation zone, nucleation zone, oxidation zone and quench zone,
- whereby in the evaporation zone the zinc powder conveyed there by an inert gas stream is evaporated in a flame of air and/or oxygen and a fuel gas, preferably hydrogen, under the proviso that the reaction parameters are chosen such that oxidation of the zinc does not occur,
- and whereby in the nucleation zone, where the hot reaction mixture, consisting of zinc vapour, water vapour as a reaction product of the flame reaction and optionally excess fuel gas, arrives from the evaporation zone, it cools to temperatures below the boiling point of zinc or is cooled by means of an inert gas,
- and whereby in the oxidation zone the mixture from the nucleation zone is oxidised with air and/or oxygen,
- and whereby in the quench zone the oxidation mixture is cooled to temperatures of below 400°C by addition of cooling gas.
9. Process according to claim 8, characterised in that in the evaporation zone an excess of fuel gas is used, expressed in lambda values of 0.5 to 0.99, preferably 0.8 to 0.95.
10. Process according to claims 8 or 9, characterised in that the temperature in the evaporation zone is between 920 °C and 2000°C and in the nucleation zone is between 500°C and 900°C, particularly preferably between 700°C and 800°C.
11. Process according to claims 8 to 10, characterised in that the cooling rate in the nucleation zone is between

100 Kelvin/seconds and 10000 Kelvin/seconds,  
particularly preferably between 2000 Kelvin/seconds and  
3000 Kelvin/seconds, and in the quench zone is between  
1000 Kelvin/seconds and 50000 Kelvin/seconds,  
5 particularly preferably between 5000 Kelvin/seconds and  
15000 Kelvin/seconds.

12. Process according to claims 8 to 11, characterised in  
that the residence time in the evaporation zone is  
between 0.1 seconds and 4 seconds, particularly  
10 preferably between 0.5 seconds and 2 seconds, in the  
nucleation zone is between 0.05 seconds and 1.00  
seconds, particularly preferably between 0.1 seconds  
and 0.2 seconds, in the oxidation zone is between 5  
milliseconds and 200 milliseconds, particularly  
15 preferably between 10 milliseconds and 30 milliseconds,  
and in the quench zone is between 0.05 seconds and 1.00  
seconds, particularly preferably between 0.1 seconds  
and 0.2 seconds.

13. Process according to claims 8 to 12, characterised in  
20 that air and/or oxygen and the fuel gas can be supplied  
to one or more points within the evaporation zone.

14. Process according to claims 8 to 13, characterised in  
that the zinc oxide powder is separated from the gas  
stream by means of a filter, cyclone, washer or other  
25 suitable separators.

15. Use of the powder according to claims 1 to 7 as a  
sunscreen, as a vulcanising agent, a dye in inks, in  
synthetic resins, in pharmaceutical and cosmetic  
preparations, as a ceramic raw material, as a catalyst.